On the life-history of *Pseudophilotes bavius* (EVERSMANN, 1832) in S. Greece, its distribution in the Peloponnesos and a new record for N. Greece (Lepidoptera : Lycaenidae)

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Abstract. *Salvia verbenaca* has been confirmed as the main, if not, exclusive host-plant of *Pseudophilotes bavius* in S. Greece. No evidence for an association of *bavius* with *Salvia argentea* has been found. Experiences in the captive rearing of *P. bavius* are detailed, along with descriptions of the early stages. The presence of the species throughout an extensive region of the Peloponnesos has been established. The especially interesting observation of *P. bavius* in N. Greece has been included at the request of the discoverer, Mr. Ib KREUTZER of Denmark. The larval host-plant at this new location has not been determined, but, as careful surveys have failed to establish the presence of *S. verbenaca*, the use of an alternative *Salvia* species is clearly indicated.

Samenvatting. Over de biologie van *Pseudophilotes bavius* (EVERSMANN, 1832) in Zuid-Griekenland, de verspreiding in de Peloponnesos en een vermelding uit Noord-Griekenland (Lepidoptera : Lycaenidae)
In Zuid-Griekenland is *Salvia verbenaca* de belangrijkste, waarschijnlijk zelfs de enige voedselplant van *P. bavius*. Ervaringen met de kweek van *P. bavius* worden meegedeeld, en een beschrijving van de eerste stadia wordt gegeven. De aanwezigheid van deze soort werd vastgesteld in een uitgestrekt gebied in de Peloponnesos. De erg interessante waarneming van een *P. bavius* populatie in Noord-Griekenland wordt meegedeeld op verzoek van de ontdekker, Ib KREUTZER (Denemarken). De voedselplant van de rups op deze nieuwe vindplaats werd niet gedetermineerd, maar, omdat gedetailleerd onderzoek aantoonde dat *S. verbenaca* in dit gebied niet voorkomt, kan aangenomen worden dat *bavius* er op een andere *Salvia*-soort leeft.

Résumé. Notes au sujet de la biologie de *Pseudophilotes bavius* (EVERSMANN, 1832) en Grèce, de sa répartition dans le Peloponnèse et d'une population dans le nord de la Grèce (Lepidoptera : Lycaenidae)
Dans le sud de la Grèce, *Salvia verbenaca* est la plante-hôte la plus importante, voire la seule de *Pseudophilotes bavius*. L'auteur fait mention d'expériences d'élevage et les premiers stades sont décrits. La présence de cette espèce est confirmée dans une vaste région du Péloponnèse. La très intéressante découverte d'une population de *P. bavius* dans le nord de la Grèce est publiée à la demande expresse de son découvreur, Ib KREUTZER (Danemark). La plante-hôte n'a toutefois pas été déterminée à ce dernier endroit. Il faut toutefois prendre en considération qu'une étude détaillée a démontrée l'absence de *S. verbenaca* dans cette région et il est donc prudent de considérer que *P. bavius* se nourrirait d'une autre espèce de *Salvia*.

Key words : *Pseudophilotes* - *bavius* - *Salvia* - *verbenaca* - distribution - ova - larva - pupa - Greece.

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The larval host-plant of *Pseudophilotes bavius* in southern Greece

According to HIGGINS & RILEY (1983), the host-plant of *Pseudophilotes bavius* (EVERSMANN, 1832) is *Salvia argentea* LINNAEUS. Curiously, HIGGINS & HARGREAVES (also in 1983), are far less specific in their assignment and, indeed, are even tentative in citing the genus *Salvia* (Labiatae). Personal doubt concerning the association of *bavius* with *S.*

argentea, at least in Greece, derives from my failure, in 1984, to find this rather conspicuous plant within the then known habitat of the butterfly. In an attempt to resolve this confusion, as well as learning something of the life-history, a systematic investigation was undertaken in the spring of 1987.

At the start of the exercise, my total knowledge of the Greek insect's distribution equated to the somewhat restricted area between Kalavrita and Zachlorou, to the north of the Aroania Mountains, and so it was here that my wife and I in the company of our friend, Mr Charles DERRY, focused our attention. The plan was simple - to locate and observe an ovipositing female. In the event, any early hope of securing this as the primary objective was soon displaced by the less ambitious desire to find a butterfly of either sex. In the 8 days of sustained effort, few specimens were found and, of the females, none showed any inclination to lay eggs. Responding to the obvious need for a change of strategy, my attention switched from insects to potential host-plants. Accordingly, I selected the dominant *Salvia* species of the region and set about the task of inspecting all the plants I could find. After 4 days, I found a greenish lycaenid ovum virtually buried amongst the dense hairs near the tip of a developing flower stem. The plant, later identified as *Salvia verbenaca* LINNAEUS, was very small, the flower stem projecting barely 5mm beyond the basal leaves. Thereafter, several more ova were found, mostly at the stem leaf/stem junction.

Occurrence of *P. bavius* in southern Greece

By locating first the host-plant and then the ova, the presence of *bavius* was established well beyond the area of our initial interest: indeed, scattered colonies of the species were found almost as far south as Sparta, some 100 km from Kalavrita. The one occasion upon which we found ova, larvae and imagines at the same site, was a particularly informative experience. In a suitable looking locality, Mr DERRY and I set off in opposite directions to explore two areas which, in all respects, appeared identical. They were, however, separated by a barrier of small trees, bushes and rocks. Both contained an abundance of *Salvia verbenaca*. After an hour, my search for ova had proved fruitless, whilst Mr DERRY had captured a female *bavius*. We then exchanged sites and within an hour I had secured 38 larvae and a few ova : my companion, on the other hand, was unable to improve upon the negative result I had achieved earlier. In a less dramatic way, this experience was repeated many times and it is clear that not all suitable looking ground qualifies as suitable for this rather local species. Regarding its more general distribution in S.E. Europe, it would appear that the availability of host-plant is not the limiting factor, as *Salvia verbenaca* occurs throughout the region. The altitudinal range of *bavius*, noted in our survey, was 600-975m. *Salvia verbenaca* was found up to 1150m and it is perhaps worth recording the observation of a few, isolated colonies of *S. argentea* above 1300m in the district of Kalavrita and Zachlorou.

Occurrence of *P. bavius* in northern Greece

In northern Greece, *Salvia verbenaca* is certainly widespread but appears to be relatively rarer and more local. My own searches for the butterfly have been unsuccessful. However, in 1989, I met Mr Ib KREUTZER of Denmark who told me he had found a small, isolated colony of *bavius* in northern Greece (south of Ptolemaida); Mr KREUTZER has invited me to include his observation in this report. Another friend, Mr Jos DILS of Antwerpen, visited the site in 1990. He found a few worn specimens of both sexes but, despite his familiarity with the host-plant in southern Greece, an extensive search by Mr DILS failed to establish the presence of *Salvia verbenaca*. Early in 1991, I too failed to confirm the presence of either *S. verbenaca* or *S. argentea*. However, I did find four other *Salvia* species, two of which, *S. officinalis* LINNAEUS and *S. viridis* LINNAEUS (=*S. horminum* LINNAEUS) (an annual), also noted by Mr DILS, were widespread and common.

A third species, having no flowers, was only tentatively identified as *S. verticillata* LINNAEUS. The fourth species, also in a non-flowering state, was provisionally identified as *S. sclarea* LINNAEUS - largely on the basis of its smell. It was represented by two, well separated colonies and it was under the basal leaves of one of these plants that I found a pupa of *bavius*. It is, of course, tempting to draw the obvious conclusion from this observation; however, considering all relevant circumstances, it cannot be precluded that this rather fortuitous find equates to no more than a happy coincidence. For one thing, the plant hosting the pupa was in close proximity to the three other *Salvia* species, none of which, by reason of their physical structure, could have afforded the same security during hibernation. To my eyes, the large, robust basal leaves of *S. sclarea* would seem particularly attractive to a larva wandering in search of a winter haven. It may also be significant that most imagines captured to date have come from sites well removed from the noted colonies of *S. sclarea*: this is certainly true of the three males I found subsequently during a week of unseasonably cold, wet and windy weather. The possibility exists, of course, that *bavius* may exploit more than one plant species in a given biotope.

Early stages

Freshly laid ova are pale green, changing to white within 24 hours. Hatching occurs after 7-8 days, producing whitish larvae barely visible to the naked eye. These were confined individually to small plastic boxes and offered small leaves and flowers. Initially, the larvae appeared to do well and most survived to their first skin-change which occurred after about 10 days. In the second instar, the larva is porcelain white with a faint brown dorsal line and a shiny, black head. Thereafter, all larvae, reared in this way, perished. A repeat of this experiment in 1989 and 1991 produced identical results. Some larvae were reared on *Salvia argentea* to no apparent detriment. Half-grown, wild larvae fared little better in boxes. Rearing on growing food-plant reduced mortality, but it was only when plants and larvae were exposed to the direct rays of the sun for most of the day, that the survival rate approached 100%. In

close confinement, larvae displayed no cannibalistic tendencies. In nature, larvae feed mostly on flower-buds and stem leaves, but on a few occasions, were found boring deeply into the woody flower stem itself. It is particularly interesting that association with ants was never observed. In the penultimate and final instars, most larvae are basically light green with short, oblique, darker green, lateral lines or patches on each segment. Further disruption to the ground colour takes the form of a dark green dorsal line. There is a sparse covering of white hairs, but dark, shorter hairs are also apparent, mainly along the dorsal region and around the honey-gland. Some larvae are pinkish-violet with the same pattern of variation of colour density as the green form. The pinkish larvae appear to correspond to those feeding exclusively on flower buds, from which, it is presumed, the larval colouration derives from the ingestion of flower pigments. Both colour forms, however, acquire a dusky pinkish-violet hue prior to pupation. The larval stage lasts about 6-7 weeks. In captivity, pupation occurs amongst leaf litter with no physical attachment. The pupa, in which stage the species overwinters, is brown with sparse, darker brown mottling. The surface is very slightly embossed. The abdominal section is somewhat bulbous and is appreciably thicker than the thoracic and head sections.

Comparison of European races

Pending the acquisition of additional material from the northern Greek locality, thereby enabling a more rigorous comparison with other European races than is presently possible, the following, provisional analysis may be of some interest.

Compared to northern Greek specimens, *bavius* from the Peloponnesos, referable to ssp. *casimiri* (HEMMING, 1932), are brighter blue with more strongly developed orange lunules on the upperside. For male ssp. *casimiri*, upperside orange lunules are always prominent in spaces 1a, 1b and 1c with occasional but diminished representation in space 2 and, more rarely, vestigial occurrence in space 3. In the limiting case, the under-development of orange lunules in the northern Greek colony takes the form of a few, orange scales, barely visible without a lens, in spaces 1a, 1b and 1c. Whilst such specimens approach ssp. *macedonicus* (SCHULTE, 1958) occurring in the districts of Skopje and Gradsko in southern Yugoslavia (SCHAIDER & JAKSIC 1988), males of this race are usually restricted to a pale orange spot in the anal angle and are a duller, greyer blue with wing margins less well-defined and more fuscous/grey than either of the Greek forms. I have no personal knowledge of ssp. *hungaricus* (DIOSZEGHY, 1913) from the Cluj district of Romania, but Mr Dirk VAN DER POORTEN of Antwerpen informs me that this race is of a brighter, silvery blue compared to ssp. *casimiri*.

It would appear that the gradation in the superficial characters referred to in respect of the Greek and Yugoslavian races, subscribes more to the concept of clinal variation than to the present, arbitrarily based subspecific assignments. Of course, a full taxonomic evaluation must be founded on more substantial evidence, which, initially, will require a viable estimate of the

intrinsic variability of the race from northern Greece.

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References

Hemming, A.F., 1932. Supplementary notes on the collection of butterflies made in Greece by general VAN STRAUBENZEE in 1931. - *Entomologist* **65**: 179-183.

Higgins, L.G. & Riley, N.D., 1983. A field guide to the butterflies of Britain and Europe (Fifth edition). Collins, London.

Higgins, L.G. & Hargreaves, B., 1983. The butterflies of Britain and Europe. Collins, London.

Schaider, P. & Jaksic, P., 1988. Die Tagfalter von jugoslawisch Mazedonien. Selbstverlag P. Schaider, München.

Boekbesprekingen

Phillips, R. & Carter, D. : *Kosmos-Atlas Schmetterlinge, europäische Tag- unf Nachtfalter.* 22,5 x 29 cm, 191 p., 404 kleurenfoto's, 80 kleurenplaten, Franckh-Kosmos Verlags-GmbH & Co., Postfach 10 60 11, D-7000 Stuttgart 10, 1991, gebonden met stofomslag, DM 78,- (ISBN 3-440-06306-2).

In 1983 werd de eerste uitgave van dit boek gepubliceerd onder de naam «Das Kosmosbuch der Schmetterlinge». Aan de kleurenfoto's werd niets veranderd. De kwaliteit daarvan was ook erg goed. Dat valt reeds op bij het lezen van het inleidend hoofdstuk over de lichaamsbouw van vlinders, hun gedrag, biotopen enz., want de tekst is doorlopend met interessante en goed uitgevoerde illustraties voorzien. Deze foto's beelden biotopen af, vlinders in hun natuurlijk milieu of piepkleine onderdelen van een vlinderlichaam zoals sprietknoppen en grijppootjes van de rupsen.

Het grootste deel van het boek wordt ingenomen door de systematische bespreking van de belangrijkste vlindergroepen. Links vindt men op een kleurenplaat een reeks opgezette vlinders uit de behandelde groep. De rechterbladzijde is gevuld met kleurenopnamen van vlinders of rupsen in hun natuurlijk milieu. In enkele tekstkolommen tussen deze rijke afbeeldingen in staan de afgebeelde soorten besproken : verspreiding, voorkomen, biotoop, voedselplanten, vliegtijd enz. Uiteraard valt de nadruk op de dagvlinders, omdat we die nu eenmaal het gemakkelijkst te zien krijgen. Toch worden er in het boek ook een heleboel nachtvlinders opgenomen en er worden zelfs enkele zogenaamde micro's opgenomen, zodat de lezen een overzicht krijgt over de hele orde van de Lepidoptera.

Dit erg verzorgd uitgegeven en stevig ingebonden boek biedt aan iedere natuurliefhebber die niet gespecialiseerd is in de studie van de Lepidoptera een rijk geïllustreerde informatiebron. Wie al meer op de hoogte is van het vlinderleven, vindt in het boek een reeks prachtige natuuropnamen, gemaakt door de beste vlinderfotografen.

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